ABSTRACT OF THE INVENTION

The invention advantageously provides automatic ranging in a passive optical network or PON. A PON with automatic ranging according to the invention comprises an optical line terminal (OLT) connected to a plurality of optical network units (ONUs), a new ONU to be connected to the OLT, and at least one OLT frame sent from the OLT to the ONUs. The OLT frame according to the invention further comprises an OLT preamble alerting a particular ONU of the plurality of ONUs of the OLT frame, an OLT start frame delimiter (SFD) indicating a start of the OLT frame, an OLT header identifying the OLT, an OLT ranging time stamp sending a ranging time clock to one of the ONUs, an OLT churning control for a churning function of the PON, an ONU number instructing the particular ONU to respond to the OLT with a ranging time stamp and a churning key, and an OLT end frame delimiter (EFD) indicating an end of the OLT frame. Upon receipt of the OLT frame from the OLT by the particular ONU of the plurality of ONUs, an ONU frame is sent back to the OLT. The ONU frame according to the invention further comprises an ONU preamble alerting the OLT of the ONU frame, an ONU start frame delimiter (SFD) indicating a start of the ONU frame, an ONU header identifying the particular ONU, an ONU ranging time stamp responding to the ONU number, an ONU churning key responding to the ONU number, and an ONU end frame delimiter (EFD) indicating an end of the ONU frame. The ONU number in the ONU frame according to the invention further comprises an ONU number preamble alerting the particular ONU of the ONU number, a start sub-frame delimiter (SSD) indicating a start of the ONU number, an ONU ID identifying the particular ONU, an automatic bandwidth adjustment beginning (ABAB), and an automatic bandwidth adjustment terminating (ABAT). With the automatic ranging method and system according to the invention, a PON can advantageously maintain its operation without serious interruption as ONUs are added or removed from the PON. Furthermore, the safety guard time between consecutive data frames in the upstream or downstream transmission is advantageously and appropriately calculated as ONUs are added to or removed from the PON in accordance with the invention.